

**Health sync**

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# Project Description

Project overview:

Hospital websites offer a user-friendly platform for patients to access essential resources like medical information, and health updates.

## Objectives

## The project aims to efficiently manage patient data, facilitate document submission, suggest alternative treatments and maintain strong data security.

## Background

## Databases have transformed healthcare by enabling efficient patient data management, and improving decision-making to ensure seamless patient care and hospital coordination.

## Literature review

## Hospital Management Systems (HMS) and e-Health technologies have significantly transformed healthcare delivery, with implementations like TeleTracking improving hospital operations through real-time tracking, despite challenges in integration and staff adaptability. In the UK, the NHS's transition to electronic health records aims to enhance patient data management but faces safety risks due to system incompatibilities and user errors, emphasizing the importance of monitoring and training.

# Project Planning

### Constraint

### Implementation Environment of the Current System:

## I - Constraints

## A- Implementation Environment of the Current System

## • The system is being developed as a hospital database to facilitate patient data access, treatment options, and doctor availability.

## • It requires a secure, scalable, and efficient database management system (DBMS) such as MySQL or PostgreSQL for data storage.

## • The system should be integrated with a web-based interface for hospital staff and patients, developed by your teammate.

## • Security measures like data encryption, user authentication, and role-based access control (RBAC) are essential to protect patient records.

## B- Anticipated Workplace Environment

## • The system is expected to be used in hospitals, clinics, and healthcare centers where patient data needs to be managed efficiently.

## • The primary users include doctors, hospital administrators, and patients who will access the system to view medical records, treatments, and doctor availability.

## • The interface should be user-friendly, ensuring that medical staff with minimal technical expertise can easily navigate it.

## • The system should be accessible through both desktops and mobile devices for flexibility in usage.

## C- Schedule Constraints

## • The project must be completed within a fixed timeline to ensure timely implementation in healthcare institutions.

## • Development phases:

## 1. Database Design & Development – Setting up tables, relationships, and constraints.

## 2. Web Application Integration – Connecting the database to the web application developed by your teammate.

## 3. Testing & Debugging – Ensuring system functionality, security, and usability.

## 4. Deployment & Training – Implementing the system and training hospital staff.

## • Unforeseen delays in data integration, security configurations, or web application development could impact the timeline, so contingency plans should be in place

### Team Members Tasks:

## Omar elsayed: database developer

## Ahmad najemddine: web developer

## Mhamad rabaa: implementation developer

### III -Ethical Issues:

1. Patient Data Privacy

• Ensuring confidentiality of patient records to prevent unauthorized access.

• Compliance with data protection laws (e.g., HIPAA, GDPR).

2. Informed Consent

• Patients must be aware and agree to how their data is stored, shared, and used.

• Clear terms of use should be provided before patients access the system.

3. Data Security and Breaches

• Preventing cyberattacks, hacking, and unauthorized data modifications.

• Using encryption, multi-factor authentication, and role-based access.

4. Doctor and Treatment Availability Transparency

• Ensuring patients are not misled about available doctors or treatment options.

• Providing accurate and up-to-date information to prevent delayed care.

5. Bias and Discrimination

• Avoiding discrimination in healthcare access based on gender, ethnicity, or socioeconomic status.

• Ensuring AI-based recommendations (if used) do not reinforce biases.

6. System Downtime and Reliability

• Ethical responsibility to ensure the system is always functional for patient care.

• Implementing backup systems to prevent data loss and service interruptions.

## 

## IV- Software Model Process:

## 1. Planning Phase

## • Define project objectives, scope, and requirements.

## • Identify key stakeholders (patients, doctors, hospital staff).

## • Set timeline and allocate tasks (database, web, implementation).

## 2. Requirements Analysis

## • Gather functional and non-functional requirements.

## • Identify necessary security measures (encryption, authentication).

## • Determine database structure (tables for patients, doctors, treatments).

## 3. System Design

## • Database Design: Entity-Relationship Diagram (ERD), table relationships.

## • Web Interface: UI/UX for patient registration, doctor selection, treatment options.

## • Security Measures: Role-based access, backup strategies.

## 4. Implementation Phase

## • Database Development: Create and test MySQL/PostgreSQL schema.

## • Web Development: Connect the database with the front-end.

## • System Integration: Ensure smooth communication between modules.

## 5. Testing Phase

## • Unit Testing: Test each module (login, patient forms, doctor selection).

## • Integration Testing: Ensure seamless interaction between database and web application.

## • Security Testing: Simulate attacks, check data protection measures.

## • User Testing: Allow hospital staff and patients to provide feedback.

## 6. Deployment Phase

## • Deploy the system in a hospital environment.

## • Provide training sessions for hospital staff.

## • Monitor system performance and collect real-time feedback.

## 7. Maintenance & Updates

## • Regular security updates and data backups.

## • Improve system features based on user feedback.

## • Ensure compliance with healthcare regulations.

### Feasibility Study:

## The feasibility study confirms that the healthcare database system is practical and beneficial. Technically, it can be implemented using MySQL/PostgreSQL for data storage and web technologies for accessibility, with encryption ensuring security. Economically, it reduces hospital administrative costs, minimizes patient wait times, and improves medical record accuracy. Operationally, hospital staff and patients can easily adapt, though training and workflow integration are needed. Legally, it must comply with healthcare data privacy laws like HIPAA and GDPR, ensuring secure patient data management. The estimated development timeline is around 7-9 months, with potential delays in real-time data integration. Overall, the project is feasible with proper planning and security meas

### Tools/Technology:

## The healthcare database system utilizes MySQL or PostgreSQL for structured data storage and MongoDB for unstructured records if needed. The backend is developed using PHP (Laravel) or Node.js (Express), with Python (Django/Flask) as an alternative. The frontend is built with HTML, CSS, JavaScript, and frameworks like React.js or Vue.js for an interactive user interface. Security measures include JWT authentication, SSL encryption, and Role-Based Access Control (RBAC) to protect sensitive patient data. Hosting is managed through AWS or Google Cloud, with Docker and Kubernetes ensuring scalability. Development and testing tools like Postman, JMeter, and Selenium help maintain system reliability. The system also integrates IoT wearable devices to monitor real-time patient vitals and uses FHIR for standardized health data exchange

### Standards:

## The healthcare database system adheres to several key standards to ensure interoperability, security, and quality. It uses FHIR and HL7 for seamless electronic health record (EHR) exchange, and DICOM for medical imaging data. Security and privacy are maintained through HIPAA (for U.S. patient data), GDPR (for European data protection), and ISO/IEC 27001 for information security management. The database follows ACID properties for reliable transactions, while software development aligns with ISO/IEC 9126 for quality attributes and IEEE 830 for requirements specifications. Web services are based on RESTful API principles, with OAuth 2.0 and OpenID Connect for secure user authentication, while ensuring accessibility compliance through W3C Web Accessibility Standards (WCAG 2.1)

### Milestones:

## The healthcare database system project begins with planning and requirements gathering, followed by system design and architecture, including database schema development and wireframing for the user interface. In the development phase, the backend is set up with CRUD operations and authentication systems, while the frontend builds patient and doctor portals with interactive forms. Integration with IoT devices for real-time health data is implemented next, followed by thorough testing, including unit, integration, and user acceptance tests. The project ensures compliance with security and privacy standards like HIPAA and GDPR before moving to deployment on cloud infrastructure. Once live, post-launch monitoring and maintenance ensure smooth operation, followed by a final project review, documentation, and training for hospital staff before project closure.